

Clustering and selection of gateways in VANET 5G

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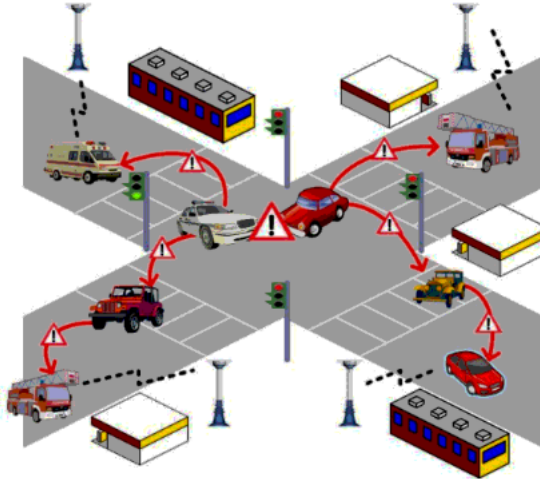
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- 1 Introduction
 - Motivations and Targets
 - Working method adopted
- 2 Simulation software
- 3 Clustering algorithm & Routing protocol
- 4 Conclusion & Future works

- Definition of VANET



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1.2. Motivations

- V2X communication
- ITS (intelligent transport system)
- 80% of collisions would have been avoided if 50% of intersections were equipped with wireless communication units (RSUs).

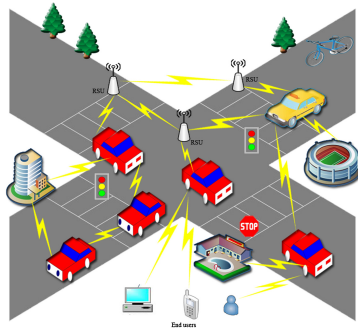


Figure: Systèmes de transport intelligents

1.3. Targets

The objective of this project is :

- to simulate intelligent algorithms for clustering
- selection of mobile gateway to relay the vehicle graph (VANET) to small cells (wifi, 5G, 4G).

1.4. Working method

- Become familiar with the simulation of VANETs in NS3.
- Integration of SUMO and OSM mobility data with NS3.
- Traffic generation for different scenarios.
- Implement clustering algorithms and mobile gateway selection under NS3 simulator for different scenarios.

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- 1 Introduction
- 2 Simulation software
 - Network Simulator 3 : ns-3
 - Simulator of Urban Mobility : SUMO
 - Open Street Map : OSM
 - Gurobi Optimizer
- 3 Clustering algorithm & Routing protocol
- 4 Conclusion & Future works

2.1. NS-3



- Discrete event network simulator, intended primarily for research and teaching.
- Free software, licensed under the GNU GPLv2 and is publicly available.
- Allows to simulate different scenarios in vehicular ad hoc networks.

2.2 SUMO



- An open source, highly portable, microscopic road traffic simulation package designed to manage large road networks.
- Primarily used to generate vehicular network scenarios.
- Allows the creation of random or accurate road maps using Open Street Map (OSM).

2.3. OSM



- A collaborative online mapping project.
- Aims to build a free geographic database of the world.
- Allows to produce paper and electronic maps.

2.4. Gurobi

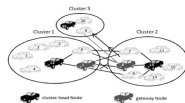


- The world's fastest mathematical programming solver,
- Available for LP (Linear Programming), QP (Quadratic Programming) and MIP (Mixed-Integer Programming) problems ...

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- 3 Clustering algorithm & Routing protocol
 - Clustering algorithm in VANET
 - GPSR routing protocol in VANET
- 4 Conclusion & Future works

3.1. Clustering & Cluster Head (CH)



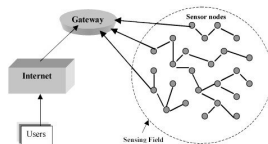
Clustering :

- reconstitution of the network in groups of nodes,
- nodes with similar characteristics belong to the same group or cluster,
- nodes with different characteristics are in different groups or clusters.

Cluster head :

- he is elected master of the cluster in which he is located,
- it acts as a mobile router,
- it receives and relays to the base station the information transmitted by the nodes of its cluster.

3.2. Greedy Perimeter Stateless Routing (GPSR)



- Greedy Perimeter Stateless Routing,
- Responsive and efficient routing protocol for wireless mobile networks,
- Exploits the correspondence between geographic position and connectivity in a wireless network to make packet forwarding decisions.

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4.1. Conclusion

- VANET are a very important sub-domain of transportation systems
- VANET provide communication between vehicles to improve traffic efficiency,
- Clustering is the process by which the network is organized into groups of nodes or clusters.
- We have learned to manipulate VANETs with the ns-3 network simulator,
- We have learned to use the linear programming solver Gurobi
- We have learned to link several software programs with different objectives but which must communicate for unique purposes (NS-3, SUMO, OSM, GUROBI),
- We have learned to do research and documentation,
- etc.

4.2. Future works

- Add for all nodes of a cluster, for example, a 5G mobile interface,
- Choose a cellular communication between nodes of the same cluster.
- More fluidity and speed (given the capabilities of 5G),
- Less bottlenecks or saturation in the vehicular network.

END
Questions?